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(54) Method and apparatus for modifying a database query.

(57) An apparatus for modifying a database query including means (300) for graphically displaying in at least two dimensions data (330) obtained from a database by the database query, means (335) for selecting at least one portion of the graphically displayed data (330), and means for modifying the database query according to the selected portion of the graphically displayed data (330). In addition, a method for modifying a database query including the steps of graphically displaying in at least two dimensions data (330) obtained from a database by the database query, selecting at least one portion of the graphically displayed data (330), and modifying the database query according to the selected portion of the graphically displayed data (330).

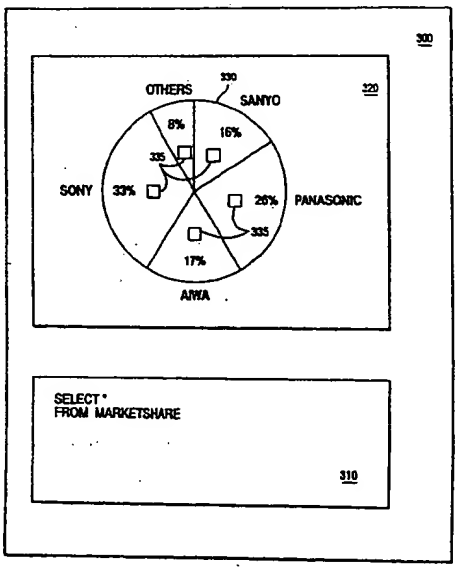

FIG. 2A

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it. The user can invoke multiple boxes as illustrated to generate multiple sets of conditions. As shown in Fig. 3D, the query statement has been modified by the location of the boxes. Once the user presses enter or clicks a second button on the mouse, Fig. 3E is generated to reflect the selection. As shown in Fig. 3E, there occurred a no sale day before each downturn in sales that was not visible in the previous higher level charts. The user can now research how these no sale days occurred to understand why sales dipped in the third quarter. It is readily apparent that the present invention provides easily accessed, powerful, and iterative capabilities to the user to aid in problem solving and data presentation.

Figs. 4A-4C illustrate a flowchart for performing a preferred embodiment of the invention. In a first step 500, query and graph windows are displayed. In step 510, the user provides a query statement. In step 520, the processing system executes the query, thereby retrieving data from a database for display. In step 530, it is determined whether this is a new graph or query or whether the query fields are different. If so, then in step 540 the graph type is obtained from the user.

In step 550, if the graph type is a bar or pie chart then processing continues to step 560. In step 560, the user chooses a result field to represent the text labels for each bar or wedge. In step 570, for each section the user chooses a result field to represent the sides of each bar or wedge. In step 580, the pie or bar graph is then drawn according to the user specifications. Then, in step 590, a check box is drawn under each bar or within each wedge. In step 600, the user may then click on any desired check boxes and press enter. In step 610, if the user clicked on any check boxes, then processing continues to step 620 else processing continues to step 630. In step 620, an "and (" clause is appended to a WHERE clause in the query statement in the preferred embodiment. This step is to limit the query statement to select data from the database corresponding to the user selected portions of the graph. In step 630, for each check box clicked by the user, a corresponding modification is made to the query statement. That is, each category or range selected is OR'd with each other category or range selected so that the query statement will obtain data from the database corresponding to each selected portion of the graph. In step 640, an ")" is appended to the end of the WHERE clause. In step 650 the modified query is then executed and the result is obtained from the database and stored in the result buffer. In step 660, the graph window is displayed and processing returns to step 530.

In step 550, if the graph type is not a value type bar or pie chart, then processing continues to step 700. In step 700, if it is determined whether the graph type is a histogram type bar or pie chart then processing continues to step 705. If it is determined that in step 705 that the graph type is a bar chart, then in step 710 the user enters the units for a Y axis of the graph. In step 720, the user enters an expression for each bar or wedge of the graph. In step 730, the pie or bar graph is drawn according to the user's specifications. In step 740, a check box is drawn under each bar or within each wedge. In step 750, the user clicks on any desired check boxes and presses enter. In step 760, if the user clicks on any check boxes, then in step 770 an "AND (" is appended to the query statement. In step 780, for each check box clicked by the user, a corresponding modification is made to the query statement as described above with reference to step 630. In step 790, an ")" is appended to the end of the where clause. Processing then continues to step 650 as described above.

In step 700, if it is determined that the graph type is not a histogram type bar or pie chart, then processing continues to step 800. In step 800, the user enters labels for the X and Y axis. In steps 810 and 820, the user enters result fields or expression to be graphed as the X and Y axis values. In step 830, the line or scatter chart is drawn to user specifications. In step 840, the user generates selection boxes around any desired ranges of the line or scatter chart. If, in step 850, it is determined that the user generated some selection boxes, then in step 860 an "AND (" is appended to the query statement. In steps 870 and 880, for each selection box generated by the user, a corresponding modification is made to the query statement as described above with reference to step 630. In step 890, an ")" is appended to the end of the where clause. Processing then continues to step 650 as described above.

Throughout the above described process, the user may use the mouse to click on the query window in step 900. If so, then in step 910, the existing query is displayed in the query window. In step 920, the user may then type in any modifications to the query or type in a new query. Processing then continues to step 650 as described above. The user may also use the mouse to click on a pull down menu bar to change the graph information in step 950. If so, then processing continues to step 540 as described above.

The present invention is not restricted to two dimensional graphics. Using the techniques defined herein, the present invention can also be easily applied to three dimensional graphics. The implementation would be a logical extension of the above described processes, and will be readily apparent to one of ordinary skill in the art. For example, for three dimensional bar or sphere

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charts, the user could select the desired categories directly with a mouse or check boxes could be provided for each region. For three dimensional surface charts, the user could utilize a three dimensional cube instead of a two dimensional box as described above with reference to the line chart. To avoid any ambiguity in utilizing a three dimensional box, the box would preferably maintain its (x,y,z) axis orientations during user manipulation. In interpreting the effects of direct manipulations on this box, this (x,y,z) axis orientation will be used to determine the meaning of a dragging operations. That is, when a corner of the box is dragged, the box is resized according to the new location of the corner. The user could then toggle between the X-Y, X-Z, and Y-Z planes for the movement of the corner to avoid ambiguity. When a side surface of the box is dragged, the box could be relocated accordingly. The user could also drag endpoints defined on the x, y, and z axis. The implementation is similar to the two dimensional line chart. Instead of providing two conditions (x and y axis) for each box, three conditions are provided (x, y, and z). Conditions within a box are joined by logical ORs. Conditions between boxes are collectively joined with AND conditions.

In addition, the present invention is not restricted to graphs related with business or scientific data only. It can also be applied to graphs for multimedia applications. As depicted in Fig. 5, a film archival system, which when searched will display results in full motion video including sound, is an ideal application. By using the query statement to select a list of frames and by presenting the results in the graph window 320, this present invention can effectively be used to find clips within the database of video. One relational database table could contain records which each have a movie or selection name, the name of the file that contains the movie, a frame identifier that contains the offset within the file of the frame in question, and a time stamp for synchronization purposes where the frame is displayed at this time stamp. The query in query window 310 could read SELECT FRAMES, FROM movie-table, WHERE TIME > 1:00:00 and TIME < 1:00:30, MOVIE = "Terminator 5". This query statement would display 30 seconds of video within graph window 320. To make scrolling through the frames effective, buttons 365 for front, back, fast, slow and regular may be used in combination for fast forward (front with fast), fast rewind (back with fast), play (front and regular), play backwards (back with regular), and single step (front or back with slow) could be presented and used. The user could then modify the query statement by selecting desired frames or groups of frames by actually selecting the images as they are displayed or be selecting a check box 370 as the images are displayed. As described above, each selection will modify the query statement provided in the query window. Of course, a separate sound query statement and window may be provided concurrently with a video window, thereby allowing the user to mix various media concurrently.

The present invention has several advantages. Users can more easily modify a database query by simply manipulating a visible graph. A user may investigate a particular portion of a graph without having to determine the exact coordinates of the desired portion. The user may use multiple boxes to specify complicated conditions. In addition, the information displayed in the graphs may include multimedia data such as screen images or audio signals.

Claims

1. An apparatus for modifying a database query comprising:

   means (300) for graphically displaying in at least two dimensions data (330) obtained from a database by the database query;

   means (335) for selecting at least one portion of the graphically displayed data (330); and

   means for modifying the database query according to the selected portion of the graphically displayed data (330).

2. The apparatus of Claim 1 further comprising means for iteratively actuating said means (300) for graphically displaying, means (335) for selecting and means for modifying.

3. The apparatus of Claim 1 or 2 wherein the means (300) for graphically displaying includes means for graphically displaying a line chart (350) of the data obtained by the database query.

4. The apparatus of Claim 3 wherein the means (335) for selecting includes means for utilizing a variable sized box (355,356) to select at least one portion of the line chart (350).

5. The apparatus of any Claim from 1 to 4 wherein the means for selecting (335) includes means for selecting multiple portions of the graphically displayed data (330).

6. The apparatus of any Claim from 1 to 5 wherein the means for modifying includes means for modifying the database query with a WHERE clause according to the selected portion of the graphically displayed data (330).

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7. A method for modifying a database query comprising the steps of:

graphically displaying in at least two dimensions data (330) obtained from a database by the database query;

selecting at least one portion of the graphically displayed data (330); and

modifying the database query according to the selected portion of the graphically displayed data (330).

8. The method of Claim 7 further comprising the step of repeating the steps of graphically displaying, selecting and modifying.

9. The method of Claim 7 or 8 wherein the step of graphically displaying includes graphically displaying a line chart (350) of the data obtained by the database query.

10. The method of Claim 9 wherein the step of selecting includes utilizing a variable sized box (355,356) to select at least one portion of the line chart (350).

11. The method of any Claim from 7 to 10 wherein the step of selecting includes selecting multiple portions of the graphically displayed data (330).

12. The method of any Claim from 7 to 11 wherein the step of modifying includes modifying the database query with a WHERE clause according to the selected portion of the graphically displayed data (330).

13. A data processing system including the apparatus of any Claim from 1 to 6.

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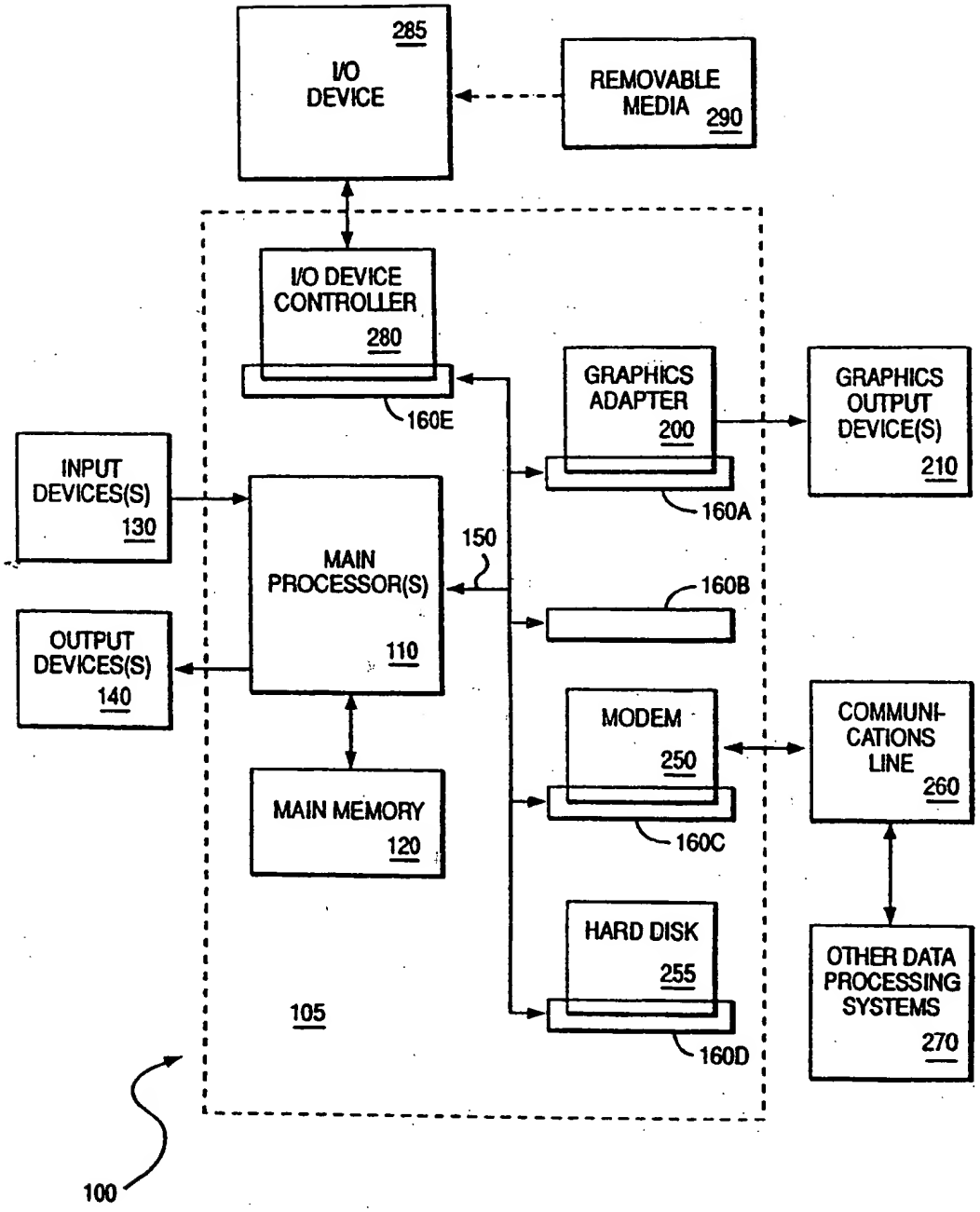
285
I/O DEVICE
REMOVABLE MEDIA 290
I/O DEVICE CONTROLLER 280
160E
GRAPHICS ADAPTER 200
160A
GRAPHICS OUTPUT DEVICE(S) 210
INPUT DEVICES(S) 130
MAIN PROCESSOR(S) 110
150
160B
OUTPUT DEVICES(S) 140
MODEM 250
160C
COMMUNI-CATIONS LINE 260
MAIN MEMORY 120
HARD DISK 255
160D
OTHER DATA PROCESSING SYSTEMS 270
105
100

FIG. 1

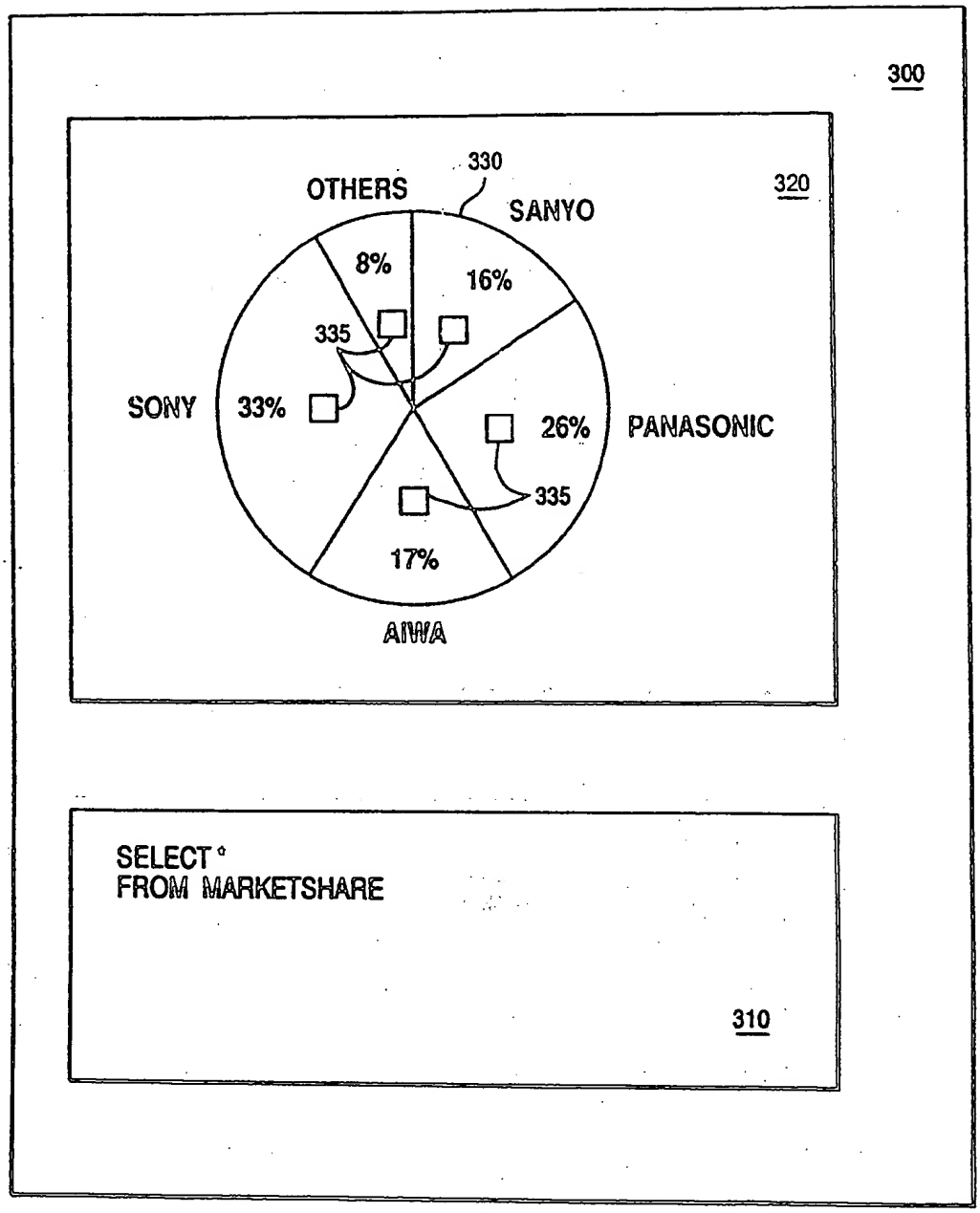
300
320
330
OTHERS
SANYO
8%
16%
335
SONY
33%
26%
PANASONIC
335
17%
AIWA
SELECT *
FROM MARKETSHARE
310

FIG. 2A

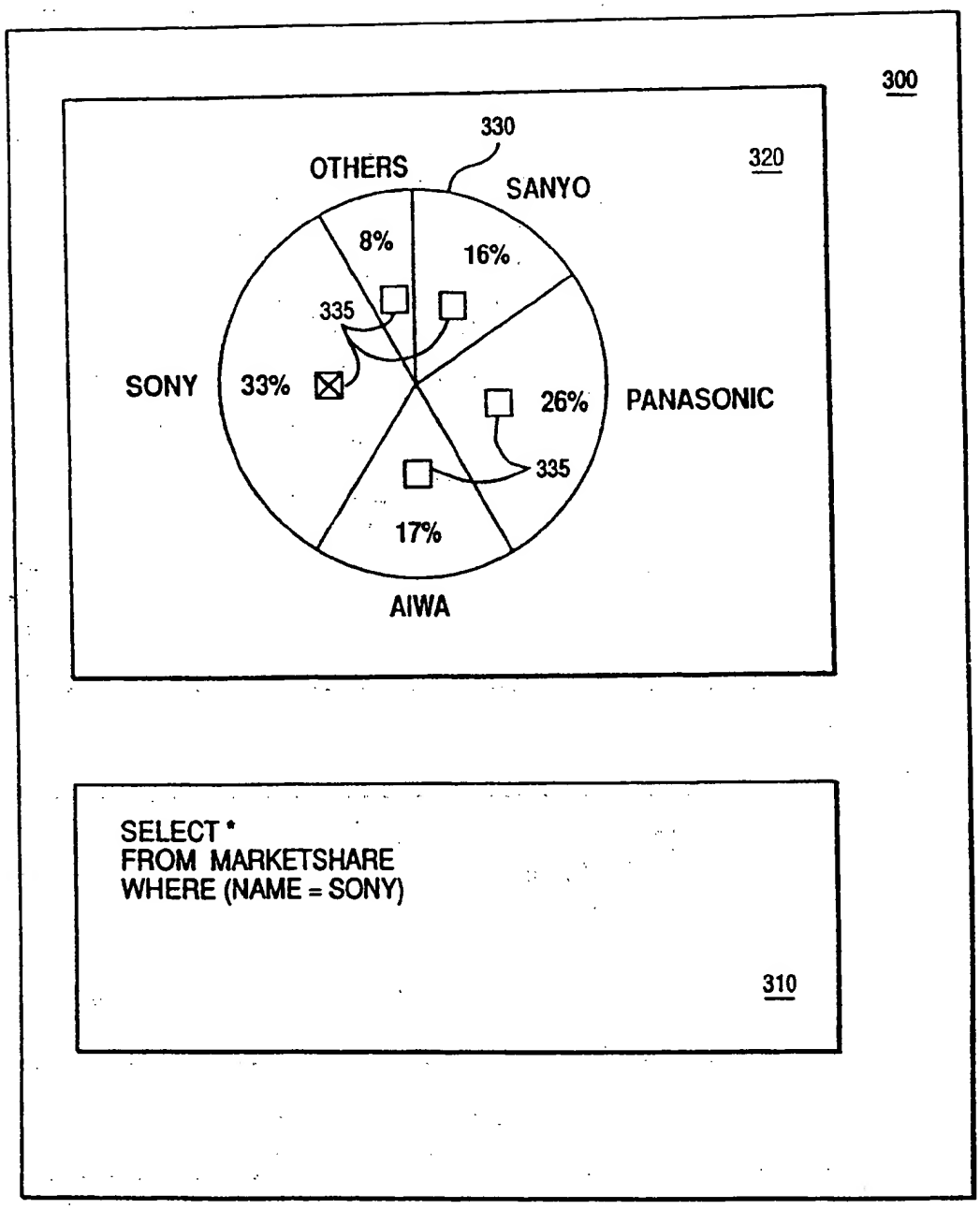
300
320
330
OTHERS
SANYO
8%
16%
335
SONY
33%
26%
PANASONIC
335
17%
AIWA
SELECT *
FROM MARKETSHARE
WHERE (NAME = SONY)
310

FIG. 2B

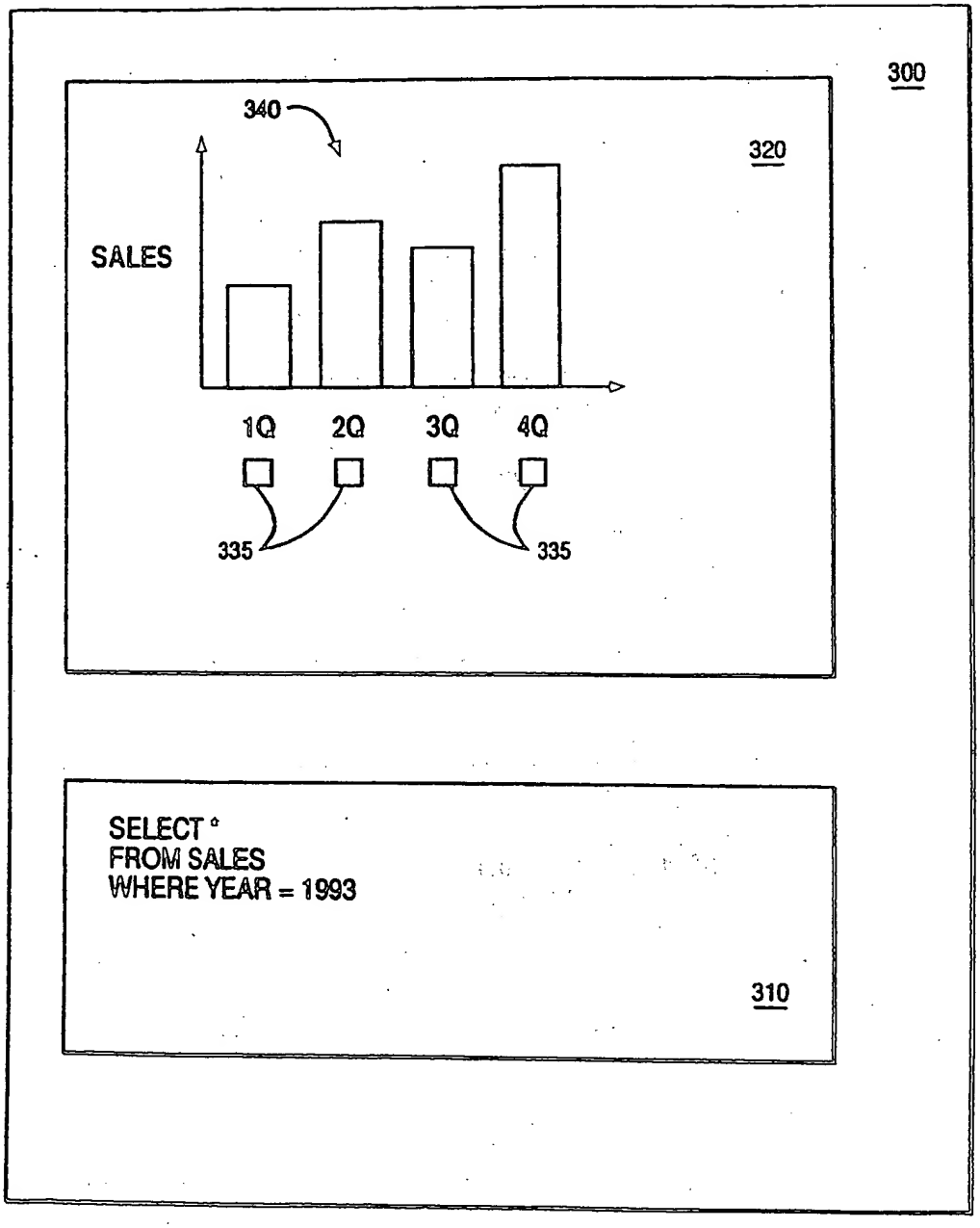
300
340
320
SALES
1Q
2Q
3Q
4Q
335
335
SELECT *
FROM SALES
WHERE YEAR = 1993
310

FIG. 3A

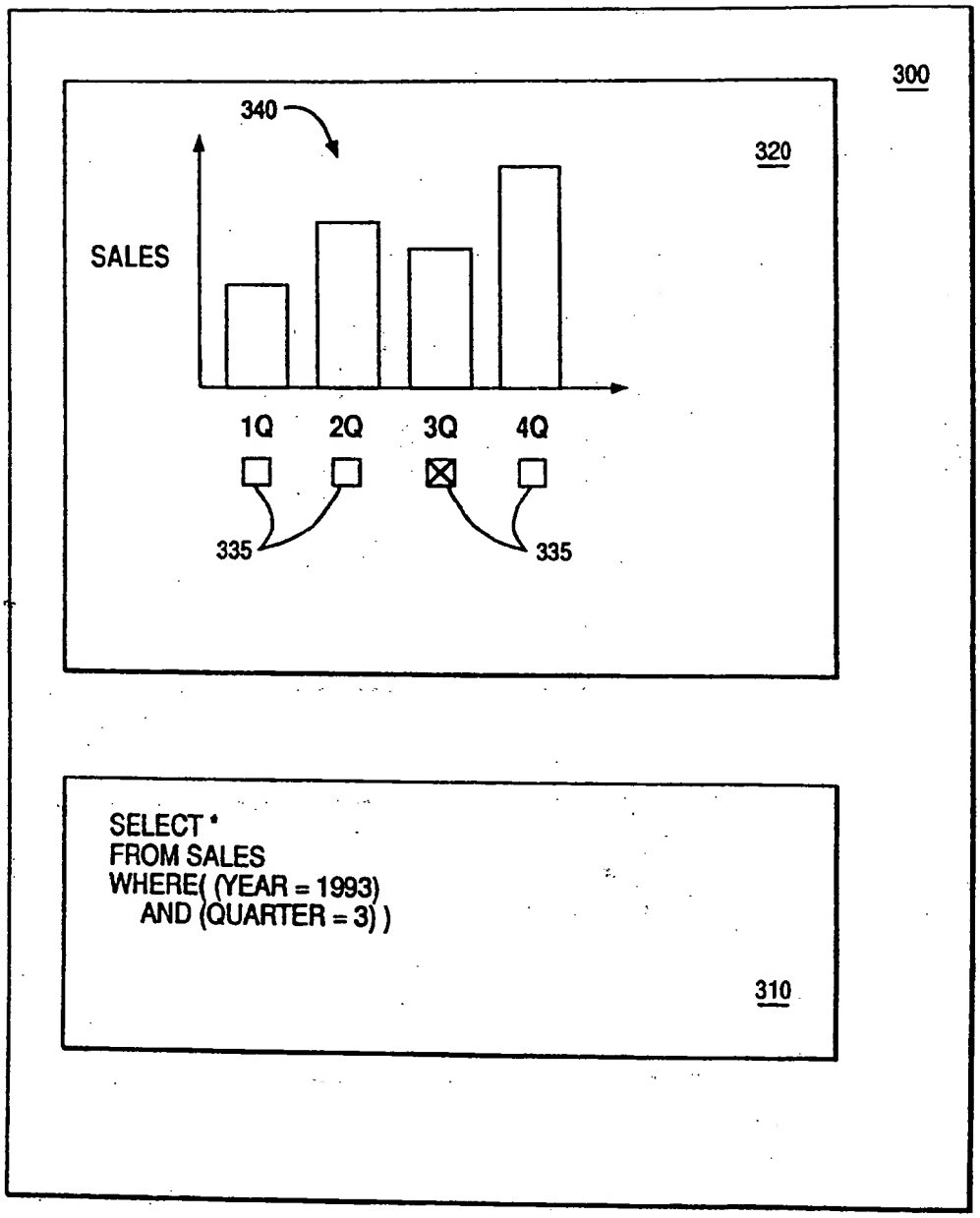
300
340
320
SALES
1Q
2Q
3Q
4Q
335
335
SELECT *
FROM SALES
WHERE((YEAR = 1993)
AND (QUARTER = 3))
310

FIG. 3B

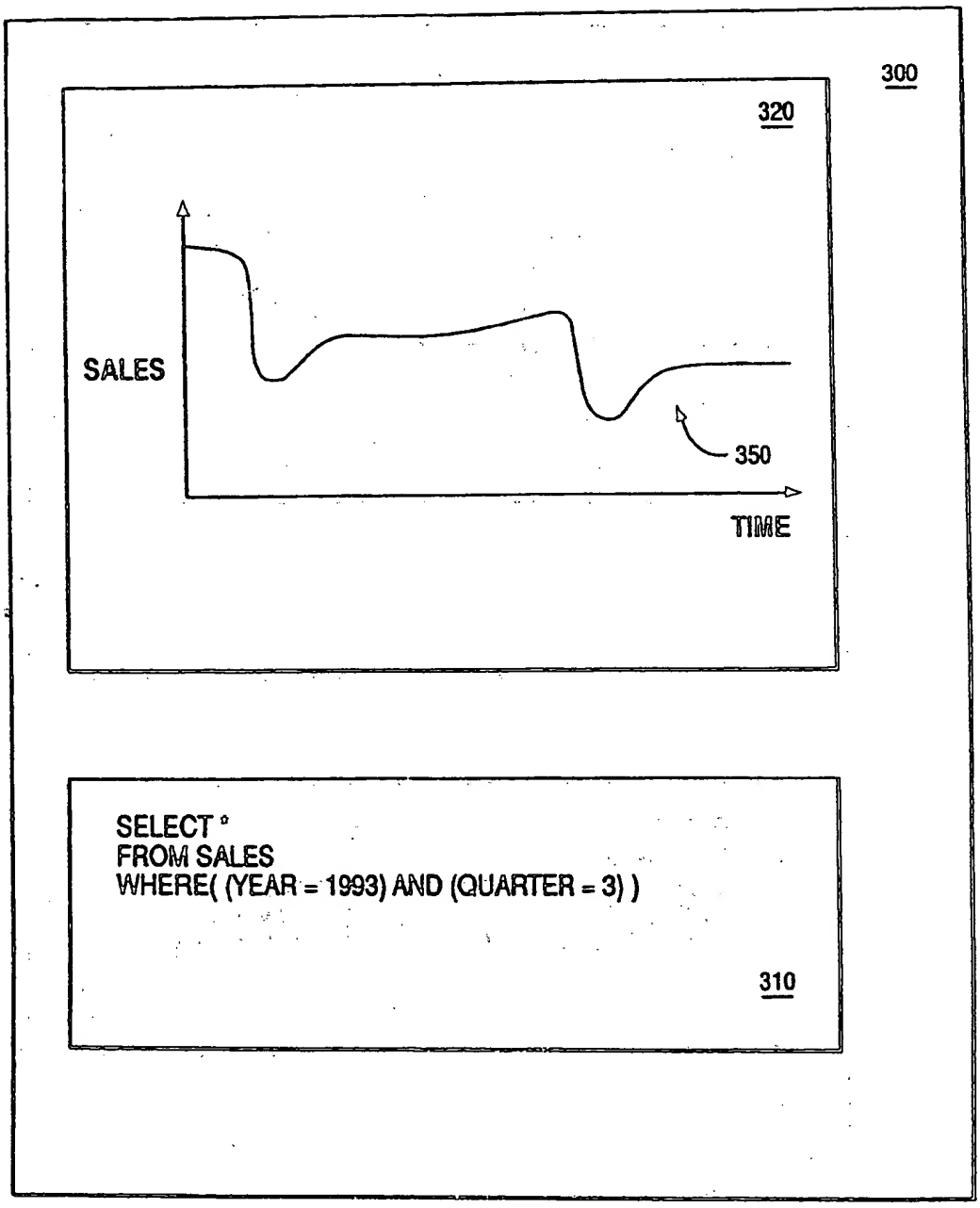
300
320
SALES
350
TIME
SELECT *
FROM SALES
WHERE((YEAR = 1993) AND (QUARTER = 3))
310

FIG. 3C

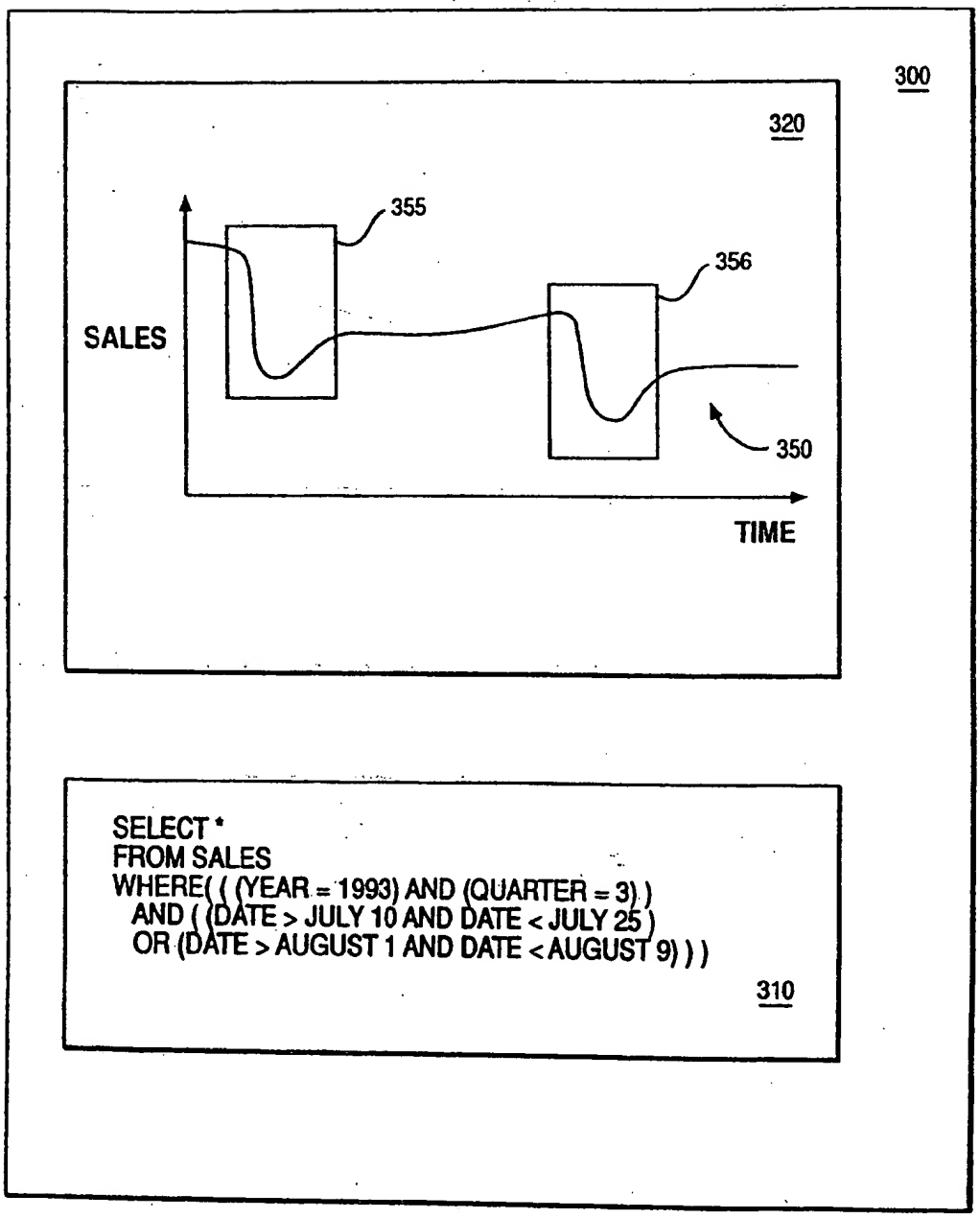
300
320
355
356
SALES
350
TIME
SELECT *
FROM SALES
WHERE(((YEAR = 1993) AND (QUARTER = 3))
AND ((DATE > JULY 10 AND DATE < JULY 25)
OR (DATE > AUGUST 1 AND DATE < AUGUST 9)))
310

FIG. 3D

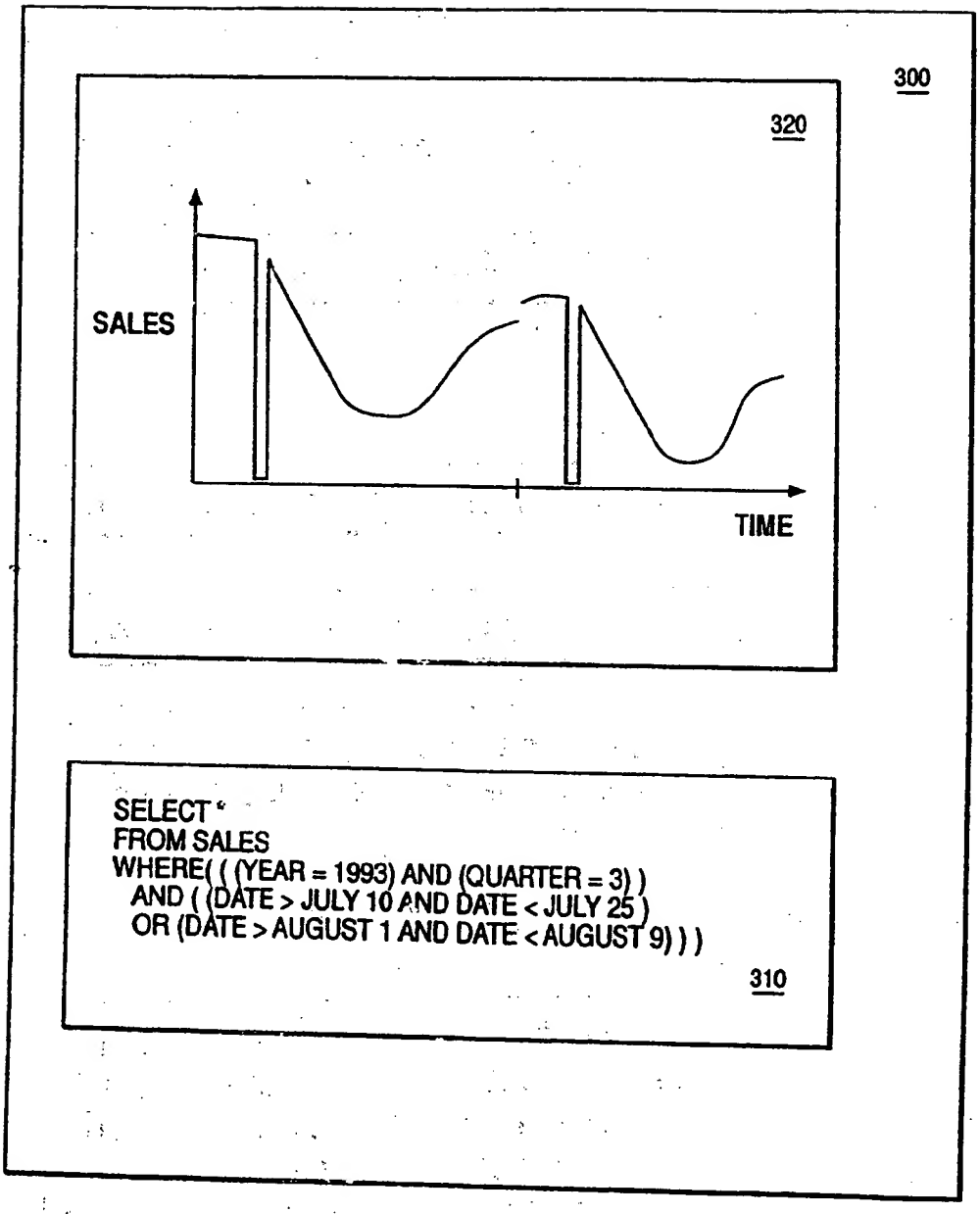
300
320
SALES
TIME
SELECT *
FROM SALES
WHERE(((YEAR = 1993) AND (QUARTER = 3))
AND ((DATE > JULY 10 AND DATE < JULY 25)
OR (DATE > AUGUST 1 AND DATE < AUGUST 9)))
310

FIG. 3E

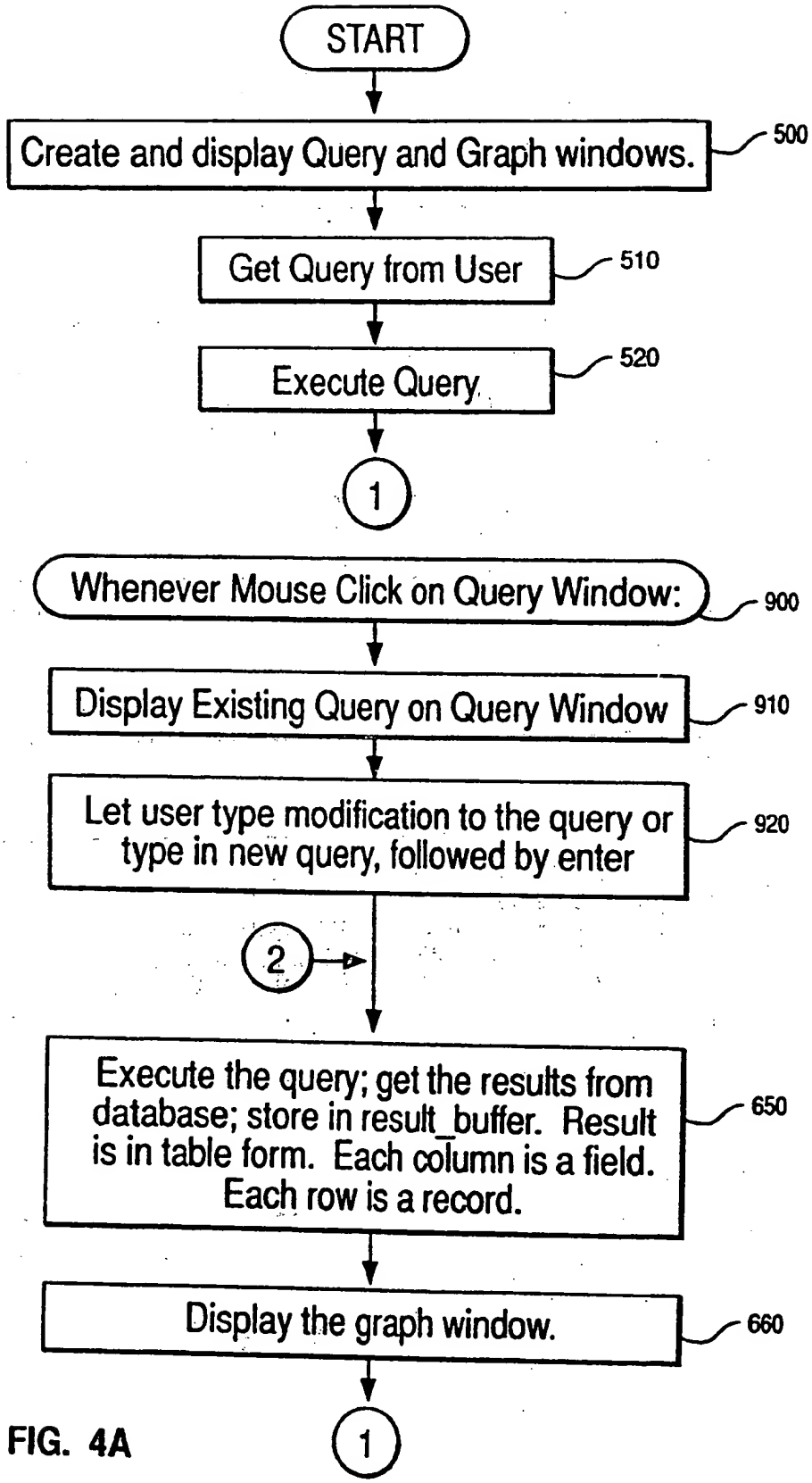
START
Create and display Query and Graph windows.
500
Get Query from User
510
Execute Query
520
1
Whenever Mouse Click on Query Window:
900
Display Existing Query on Query Window
910
Let user type modification to the query or type in new query, followed by enter
920
2
Execute the query; get the results from database; store in result_buffer. Result is in table form. Each column is a field. Each row is a record.
650
Display the graph window.
660
1

FIG. 4A

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 10 7175

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	EP-A-0 477 152 (I.B.M. CORPORATION) 25 March 1992 * abstract *	1,7	G06F15/403
A	EP-A-0 491 517 (I.B.M. CORPORATION) 24 June 1992 * abstract; claims 1-10; figure 5I *	1,7	

TECHNICAL FIELDS SEARCHED (Int.Cl.5)

G06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 September 1994	Katerbau, R

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

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